(11)Publication number : 10-280070
(43)Date of publication of application : 20.10.1998

(51)Int.Cl.
C22C 5/04
C22C 1/10
C22C 32/00
C22F 1/14
// C22F 1/00
C22F 1/00
C22F 1/00
C22F 1/00
C22F 1/00
C22F 1/00

(21)Application number : 10-096116
(22)Date of filing : 08.04.1998

(71)Applicant : WC HERAEUS GMBH
(72)Inventor : FISCHER BERND
GOY KARL-HEINZ
KOCK WULF DR
LUPTON DAVID FRANCIS DR
MANHARDT HARALD
MERKER JUERGEN DR
SCHOELZ FRIEDHOLD
ZUROWSKI BERTHOLD

(30)Priority
Priority number : 97 19714365 Priority date : 08.04.1997 Priority country : DE

(54) DISPERSIVELY SOLIDIFIED PLATINUM MATERIAL, PRODUCTION OF THE MATERIAL AND USE OF THE MATERIAL

(57)Abstract:
PROBLEM TO BE SOLVED: To improve the stability with the lapse of time at high temps. of a platinum material by subjecting a platinum material incorporated with a specified amt. of base metal composed of cerium as simple substance or the combination of cerium, yttrium and zirconium to heating treatment, precipitating base metal-contg. elements as fine oxides by internal oxidation and dispersively strengthening the material.
SOLUTION: This platinum material is composed of P or of an alloy obtd. by

independently added Rh, Ir and Au to Pt. This platinum material is incorporated with base metal composed of Ce as simple substance or of two kinds of combinations among Ce, Y and Zr, which is melted to form into a platinum- base metal alloy contg. these base metal elements by 0.005 to 1 wt.% and after that, it is heated at 600 to 1400°C in an oxidizing atmosphere to oxidize at least 75%, preferably, 90% of the base metal elements in the alloy. As an oxidizing medium, air, oxygen, water vapor, water vapor and hydrogen, a rare gas or nitrogen is used. This alloy shows excellent secular stability even at high temps. exceeding 1200°C, but, hot or cold working or welding may be performed before and after the heating treatment.

[Claim 1]In a platinum material in which distributed solidification was carried out by particles which consist of a base metal oxide, and which were distributed minutely, a base metal is cerium or it is a mixture which consists of at least two of element yttrium, a zirconium, and cerium -- and a base metal -- a platinum material by which distributed solidification was carried out even if small, wherein 75 % of the weight exists as an oxide.

[Claim 2]a base metal -- the platinum material according to claim 1 in which 90 % of the weight exists as an oxide even if small.

[Claim 3]The platinum material according to claim 1 or 2 whose base metal content is 0.005 to 1 % of the weight.

[Claim 4]The platinum material according to claim 3 whose cerium content a nonmetal consists of cerium and is 0.005 to 0.3 % of the weight.

[Claim 5]The platinum material according to claim 4 whose cerium content is 0.01 to 0.2 % of the weight.

[Claim 6]The platinum material according to claim 3 whose content of yttrium and a zirconium a base metal consists of yttrium and a zirconium, and is 0.005 to 1 % of the weight.

[Claim 7]The platinum material according to claim 6 whose content of yttrium and a zirconium is 0.05 to 0.5 % of the weight.

[Claim 8]The platinum material according to claim 3 whose content of yttrium and cerium a base metal consists of yttrium and cerium, and is 0.005 to 0.5 % of the weight.

[Claim 9]The platinum material according to claim 8 whose content of yttrium and cerium is 0.01 to 0.3 % of the weight.

[Claim 10]The platinum material according to claim 3 whose content of a zirconium and cerium a base metal consists of a zirconium and cerium, and is 0.005 to 0.5 % of the weight.

[Claim 11]The platinum material according to claim 10 whose content of a zirconium and cerium is 0.01 to 0.3 % of the weight.

[Claim 12]The platinum material according to claim 3 whose content of yttrium, a zirconium, and cerium a base metal consists of yttrium, a zirconium, and cerium, and is 0.005 to 0.5 % of the weight.

[Claim 13]The platinum material according to claim 12 whose content of yttrium, a zirconium, and cerium is 0.01 to 0.3 % of the weight.

[Claim 14]A platinum material given [to claims 1-13] in any 1 paragraph in which a platinum material consists of platinum by which distributed solidification was carried out, a platinum rhodium alloy by which distributed solidification was carried out, a platinum iridium alloy by which distributed solidification was carried out, or a platinum-gold-alloy by which distributed solidification was carried out.

[Claim 15]The platinum material according to claim 14 whose rhodium content of a platinum rhodium alloy is 0.5 to 25 % of the weight.

[Claim 16]The platinum material according to claim 14 whose iridium content of a platinum iridium alloy is 0.3 to 50 % of the weight.

[Claim 17]The platinum material according to claim 14 whose golden content of a platinum-gold-alloy is 0.5 to 8 % of the weight.

[Claim 18]In a method of manufacturing a platinum material in which distributed solidification was carried out by particles which consist of a base metal oxide, and which were distributed minutely while fusing casting a platinum-base metal-alloy and heat-treating a platinum-base metal-alloy in an oxidizing medium, A platinum-base metal-alloy containing a mixture which consists of at least two in cerium or element yttrium, a zirconium, and cerium as a base metal is fused, and -- casting -- and a base metal -- a manufacturing method of a platinum material by which distributed solidification was carried out characterized by heat-treating at 600-1400 ** among an oxidizing medium until 75 % of the weight oxidizes, even if small.

[Claim 19]heat treatment -- a base metal -- a method according to claim 18 of performing until 90 % of the weight oxidizes, even if small.

[Claim 20]A method according to claim 18 or 19 of using atmosphere which consists of a mixture, rare gas, or nitrogen which consists of air, oxygen, a steam or a steam, and hydrogen as an oxidizing medium.

[Claim 21]A method according to claim 19 or 20 of performing cold work before heat treatment and/or to the back.

[Claim 22]A method according to claim 19 or 20 of performing hot working before heat treatment and/or to the back.

[Claim 23]A method given [to claims 19-22] in any 1 paragraph which uses a welding process before heat treatment and/or for the back.

[Claim 24]A method given [to claims 19-23] in any 1 paragraph of fusing and casting a platinum-base metal-alloy which has 0.005 to 1 % of the weight of base metal contents.

[Claim 25]A method given [to claims 19-24] in any 1 paragraph of fusing and casting a platinum-base metal-alloy which contains cerium in 0.005 to 0.5% of the weight of quantity as a base metal.

[Claim 26]A method according to claim 25 of fusing and casting a platinum-base metal-alloy which contains cerium in 0.01 to 0.3% of the weight of quantity as a base metal.

[Claim 27]A method given [to claims 19-24] in any 1 paragraph of fusing and casting a platinum-base metal-alloy which contains yttrium and a zirconium in 0.005 to 1% of the weight of quantity as a base metal.

[Claim 28]A method according to claim 27 of fusing and casting a platinum-base metal-alloy which contains yttrium and a zirconium in 0.05 to 0.5% of the weight of quantity as a base metal.

[Claim 29]A method given [to claims 19-24] in any 1 paragraph of fusing and casting a platinum-base metal-alloy which contains yttrium and cerium in 0.005 to 0.3% of the weight of quantity as a base metal.

[Claim 30]A method according to claim 29 of fusing and casting a platinum-base metal-alloy which contains yttrium and cerium in 0.01 to 0.2% of the weight of quantity as a base metal.

[Claim 31]A method given [to claims 19-24] in any 1 paragraph of fusing and casting a platinum-base metal-alloy which contains a zirconium and cerium in 0.005 to 0.5% of the weight of quantity as a base metal.

[Claim 32]A method according to claim 31 of fusing and casting a platinum-base metal-alloy which contains a zirconium and cerium in 0.01 to 0.3% of the weight of quantity as a base metal.

[Claim 33]A method given [to claims 19-24] in any 1 paragraph of fusing and casting a platinum-base metal-alloy which contains yttrium, a zirconium, and cerium in 0.005 to 0.5% of the weight of quantity as a base metal.

[Claim 34]A method according to claim 33 of fusing and casting a platinum-base metal-

alloy which contains yttrium, a zirconium, and cerium in 0.01 to 0.3% of the weight of quantity as a base metal.

[Claim 35]A method given [to claims 19-34] in any 1 paragraph of fusing and casting a rhodium content platinum-base metal-alloy which has 0.5 to 25 % of the weight of rhodium contents.

[Claim 36]A method given [to claims 19-34] in any 1 paragraph of fusing and casting an iridium content platinum-base metal-alloy which has 0.3 to 50 % of the weight of iridium contents.

[Claim 37]A method given [to claims 19-34] in any 1 paragraph of fusing and casting a golden content platinum-base metal-alloy of having 0.5 to 8 % of the weight of golden contents.

[Claim 38]Use of a platinum material in which the distributed solidification of the any 1 paragraph statement to claims 1-17 for a device which should be used in glass industry was carried out.

[Claim 39]Use of a platinum material in which the distributed solidification of the any 1 paragraph statement to claims 1-17 for a device which should be used in a laboratory was carried out.

[Claim 40]Use of a platinum material in which the distributed solidification of the any 1 paragraph statement to claims 1-17 for manufacture of covering was carried out.

[Claim 41]Use of a platinum material in which the distributed solidification of the any 1 paragraph statement to claims 1-17 as a charge of welding add-in material was carried out.

[0001]
[Field of the Invention]This invention relates to the use of the manufacturing method of a platinum material and this material, and this material in which distributed solidification was carried out by the particles which consist of a base metal oxide, and which were distributed minutely.

[0002]Especially this invention relates to the platinum material which consists of the platinum in which the distributed solidification of the form of half-finished products or a finished product was carried out or the platinum rhodium alloy by which distributed solidification was carried out, a platinum iridium alloy, and a platinum-gold-alloy.

[0003]
[Description of the Prior Art]When platinum metal is distributed uniformly and it contains the particles of insolubility in a slight quantity, it is publicly known to have high heat resistance. Generally particles consist of a zirconium dioxide or yttrium oxide.

Distributed solidification was carried out or this kind of platinum metal is called as dispersion hardening was carried out. The platinum material by which distributed solidification was carried out is especially excellent in the resistance over the corrosion and oxidation in an elevated temperature, and is used by glass industry for the stability to glass melting, and this is written for example, in the Federal Republic of Germany patent 4440704CNo. 2 specification. Manufacture of this material may be performed by various methods (E.). [DOUROSUTO (E. Drost) and] H. GERITTSUA (H. Goelitzer), M. Poniatowski (M. Poniatowski), S. TSUOINA (S. Zeuner)-Metall 50 (1966), 492-498.

[0004]Another method of improving the heat resistance of platinum and platinum metal is carrying out the mixing alloy of rhodium or other suitable metal. That is, the platinum metal alloy which contains 0.01 to 0.1% advantageously, for example from the statement of the Federal Republic of Germany patent 1533267CNo. 1 specification in 0.005 to 0.2% of one or more rare earth metals and which was manufactured by scorification is publicly known. a platinum metal alloy must be used as a material which manufactures the device for a spinning nozzle, a catalyst network, the chemical industry, and the same use field, and growth of not less than 500 ** alloy ****** in an elevated temperature must be avoided in these cases. The palladium silver which has as an example platinum-rhodium [which has cerium 0.005%], platinum-gold [which has lantern 0.02%], palladium [which has yttrium 0.01%], and gadolinium 0.005% is mentioned.

[0005]The Federal Republic of Germany patent application public presentation 1783074ANo. 1 specification is related with the material on the basis of the platinum metal or gold in which dispersion hardening was carried out by internal oxidation. This material is manufactured by the curing treatment with the passage of time in two steps of heat treatment-300-800 **, and oxidation treatment - in 800-1400 ** from the alloy of these metal and an element which has heat of formation with an expensive oxide. In order that an alloy may shorten the form of a wire rod or sheet metal, or - oxidation time, for example - It may be used in the form of the powder (particle size of about 50-500 micrometers) obtained by grinding a close alloy body mechanically. For example, a platinum-zirconium alloy, a platinum-rhodium zirconium alloy, and a platinum-palladium zirconium alloy are suitable. A very microparticulate zirconium dioxide sludge is obtained and the diameter of; oxide particle is within the limits until it exceeds 0.1 to [less than] one micrometer. With a zirconium, an oxide is suitable also for the element, for example, aluminum, beryllium, titanium, hafnium, tantalum, and the thorium of the others which have high heat of formation. These contents are 0.1 to 5%.

[0006]From the statement of U.S. Pat. No. 4014692 and a 4123263 specification. 10 to 40 % of the weight of suitable rhodium especially for a glass fiber spinning nozzle manufactured by scorification, 0.001 to 0.5 % of the weight of boron, 0.015 to 1.25 % of the weight of zirconiums, and the remainder have a publicly known platinum material of the creep stability which consists of platinum. In this case, completely selectively, although the zirconium may be replaced by hafnium, magnesium, yttrium, a lantern, titanium, niobium, and tantalum,;, however its zirconium content platinum material are advantageous.

[0007]the [British patent] -- the statement of a 2085028A item specification, Platinum metal (platinum, rhodium, palladium, a ruthenium, iridium), It is suitable for the machinery and the device with which especially this alloy contacts glass melting liquid about gold and the alloy ("grain stabilised") which especially consist of a crystal grain stabilizing agent, and by which crystal grain stabilization was carried out, and in order to make a specimen decay, it is suitable for X ray fluorescence spectroscopy. A granulation stabilizing agent is the oxide, the carbide, the nitride, and silicide of the element which has high reactivity as compared with platinum and gold. The examples of such an element are a scandium, yttrium, thorium, a zirconium, hafnium, titanium, aluminum, and a lanthanide, and are advantageous. [of; zirconium and thorium] The golden content in an alloy is 3 to 8 % of the weight advantageously, and the quantity of a crystal grain stabilizing agent is 0.5 or less % of the weight. The manufacture of the alloy by spraying especially the melting liquid which consists of platinum metal, gold, and a reaction element as an advantageous thing in the atmosphere which enables oxide formation, for example is indicated. In such an alloy, a crystal grain stability oxide exists in the quantity which ****s in the conversion rate of 75 to 80% of the element to an oxide. The quantity of the unreacted element should be 0.025 or less % of the weight because of disadvantageous influence on grain growth.

[0008]In the East Germany patent No. 157709 specification, 0.01 to 0.5% of yttrium, 0.001 to 0.5% of boron, 0.001 to 0.5% of calcium, and the platinum metal alloy in which a residue consists of gold and nickel depending on one or more platinum metal and the case are indicated. An alloy may be manufactured with scorification, and the state which has not oxidized, and where internal oxidation is carried out, it may be used. This alloy shows a grain size number almost original also in long-term mechanical stress, heat stress, chemical stress, and corrosion stress, and; creep stability and temporal stability are very good.

[0009]Into Neue Huette 35 (1990) and 391-393, the research on the character of a platinum alloy with yttrium and boron is reported.
The fine structure and the character of the platinum alloy by which dispersion hardening was carried out using yttrium and a zirconium are reported to Platinum Metals Rev. (1995), and 39,167-170.

[0010]From the statement of the Federal Republic of Germany patent 19531242CNo. 1 specification, the heat-resistant platinum material which consists of platinum and a zirconium and/or 0.1 to 0.35 % of the weight of zirconium oxide and boron, and/or 0.002 to 0.02 % of the weight of boron oxide is publicly known. A platinum material is manufactured by fusing the platinum-zirconium boron-alloy which contains a zirconium and boron advantageously, casting to an ingot, and cold-rolling to sheet metal, and carrying out half-an-hour red heat at 1000 ** among argon or the air. The oxidizing red heat which a heat-resistant oxide produces brings about the rise of temporal stability, and a ductile reduction at a room temperature. The platinum material manufactured by the melting metallurgical method and the platinum material (FKS-platinum) which were manufactured by powder-metallurgy processing which has intrinsically high temporal stability and by which zirconium dioxide hardening was carried out are chosen

economically.

[0011]
[Problem(s) to be Solved by the Invention]In this invention, contain the unoxidized base metal of the slightest possible quantity, and it has high temporal stability also at the temperature which exceeds 1200 **, And the technical problem that the platinum material in which distributed solidification was carried out by the particles which consist of a base metal oxide as a very good deformation behavior shown, and which were distributed minutely was found out was imposed as the foundation.

[0012]Especially the platinum material should be a material which consists of the platinum by which distributed solidification was carried out or the platinum rhodium alloy by which distributed solidification was carried out, a platinum iridium alloy, and a platinum-gold-alloy. The manufacturing method of the platinum material by this invention which furthermore includes melting of a platinum-base metal-alloy and casting should be indicated. Especially the platinum material must be suitable for use by glass industry.

[0013]
[Means for Solving the Problem]according to this invention, a base metal is cerium or a platinum material in which solution of a technical problem is shown is a mixture which consists of at least two in element yttrium, a zirconium, and cerium -- and a base metal -- even if small, when 75 % of the weight exists as an oxide, it characterizes.

[0014]especially -- a base metal -- even if small, when 90 % of the weight existed as an oxide, it became clear that a platinum material by this invention was effective.

[0015]A base metal content of a platinum material is 0.005 to 1 % of the weight preferably.

[0016]In the case of an embodiment of the platinum material according to claim 1, a base metal, (a) When formed from a mixture in which it may be formed from cerium or a base metal consists of at least two in element yttrium, a zirconium, and cerium, (b) It may be formed from a combination thing of yttrium and a zirconium, (c) yttrium and cerium, the (d) zirconium and cerium or (e) yttrium, a zirconium, and cerium.

[0017]When quantity of a base metal for an embodiment is as follows, a platinum material by this invention, : (a) an effective thing was proved that it is -- 0.01 to 0.2% of the weight especially 0.005 to 0.3% of the weight, (b) 0.005 to 1 % of the weight -- especially -- 0.05 to 0.5 % of the weight, and (c)0.005-0.5 % of the weight -- especially -- 0.01 to 0.3 % of the weight, and (d)0.005-0.5 % of the weight -- especially -- 0.01 to 0.3 % of the weight, and (e)0.005-0.5 % of the weight -- especially -- 0.01 to 0.3 % of the weight.

[0018]2 to 70 % of the weight of :(b) yttrium oxide in which a mixture of an oxide consists of the following in the case of an embodiment, Advantageously 5 to 20 % of the

weight, and 30 to 98 % of the weight of zirconium oxide, Advantageously 80 to 95 % of the weight, 2 to 70 % of the weight of (c) yttrium oxide, 5 to 20 % of the weight and 30 to 98 % of the weight of cerium oxide advantageously 80 to 95 % of the weight, 30 to 98 % of the weight of zirconium oxide advantageously (d) 80 to 95 % of the weight, And 70 to 95 % of the weight and 2 to 70 % of the weight of cerium oxide are [2 to 70 % of the weight of cerium oxide / 5 to 20 % of the weight, and 2 to 70 % of the weight of (e) yttrium oxide / 2 to 20 % of the weight, and 30 to 96 % of the weight of zirconium oxide] 2 to 50 % of the weight advantageously.

[0019]Furthermore, while solution of a technical problem fuses and casts a platinum-base metal-alloy and heat-treats it in an oxidizing medium, It is in a method of manufacturing a platinum material in which distributed solidification was carried out by particles which consist of a base metal oxide, and which were distributed minutely, This method fuses a platinum-base metal-alloy containing a mixture which consists of at least two in cerium or element yttrium, a zirconium, and cerium as a base metal, and -- casting -- and a base metal -- it characterizes by heat-treating at 600-1400 ** among an oxidizing medium until 75 % of the weight oxidizes, even if small.

[0020]a base metal -- when heat treatment was performed until 90 % of the weight oxidized, even if small, it became clear that especially this method was effective.

[0021]An oxidizing medium needed for a method by this invention means a medium which produces oxidation of a base metal instead of the precious metals in a 600-1400 ** temperature requirement within the limits of this invention. It is the atmosphere which consists of a mixture which consists of air, oxygen, a steam or a steam, and hydrogen, rare gas especially helium, argon, or nitrogen preferably.

[0022]a base metal -- even if small, although especially heat treating time required for at least 90% of the weight of oxidation is checked from a preliminary test, when it is this examination, quantity of oxygen absorbed during heat treatment progress of a platinum-base metal-alloy is measured in relation to time 75% of the weight. Measurement of oxygen makes a specimen and carbon which a platinum material fused react (to carbon monoxide), and is due to determination-of-carbon-dioxide infrared spectroscopic analysis succeedingly formed by oxidation, and is explained in full detail in Example 15.

[0023]According to this invention, melting of the platinum-base metal-alloy which has 0.005 to 1% of the weight of a base metal content advantageously is carried out, and it is cast. An alloy contains only platinum as the precious metals, or, in addition, contains 0.5 to 25 % of the weight of rhodium, 0.3 to 50 % of the weight of iridium, or 0.5 to 8 % of the weight of gold with platinum.

[0024]Especially as a base metal, 0.005 to 0.3% of the weight Cerium of 0.01 to 0.2% of the weight of quantity, Especially 0.005 to 1% of the weight Yttrium and a zirconium of 0.05 to 0.5% of the weight of quantity, Especially 0.005 to 0.5% of the weight Yttrium and cerium of 0.01 to 0.3% of the weight of quantity, It became clear especially be a zirconium of 0.01 to 0.3% of the weight of quantity, be cerium, and that yttrium, a

zirconium, and cerium of 0.01 to 0.3% of the weight of quantity were especially effective 0.005 to 0.5% of the weight 0.005 to 0.5% of the weight.

[0025]An embodiment of a platinum material in which distributed solidification was carried out by this invention in the following example in order to explain this invention in full detail, And as manufacture (Examples 1-10) of a platinum material by a method of this invention, and - comparison - Publicly known distributed solidification additive agent yttrium (Example 11), Use of a method by this invention about a platinum-alloy containing a zirconium (Example 12), yttrium, boron (Example 13), a zirconium, and boron (Example 14) is indicated. Platinum used into an example has 99.95% of purity.

[0026]In Example 15, measurement of an oxygen content of a platinum material indicated in Example 1-14, platinum and platinum / rhodium 10 is indicated.

[0027]Example 16 is related with measurement of the temporal stability of a platinum material by this invention indicated in Example 1-10, a platinum material in which the distributed solidification of two marketing was carried out, the platinum/rhodium 10, and the platinum/gold 5.

[0028]
[Example]
The alloy precursor 250g which consists of the example 1 platinum 4675g, 97 % of the weight of platinum, and 3 % of the weight of zirconiums, And from the alloy precursor 75g which consists of 99 % of the weight of platinum, and 1 % of the weight of yttrium, the platinum alloy which has 0.15 % of the weight of zirconiums and 0.015 % of the weight of yttrium is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible. A platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2.4-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal for 200 hours.

[0029]The alloy precursor 200g which consists of the example 2 platinum 4730g, 97 % of the weight of platinum, and 3 % of the weight of zirconiums, And from the alloy precursor 70g which consists of 99 % of the weight of platinum, and 1 % of the weight of yttrium, the platinum alloy which has 0.12 % of the weight of zirconiums and 0.014 % of the weight of yttrium is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible. A platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2.4-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal for 200 hours.

[0030]The alloy precursor 167g which consists of the example 3 platinum 4683g, 97 % of the weight of platinum, and 3 % of the weight of zirconiums, And from the alloy precursor 150g which consists of 99 % of the weight of platinum, and 1 % of the weight of yttrium, the platinum alloy which has 0.1 % of the weight of zirconiums and 0.03 % of the weight of yttrium is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible. This platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot.

Next, 1000 ** heat treatment is performed to sheet metal for 200 hours.

[0031]The platinum alloy which has 0.21 % of the weight of cerium is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible from the alloy precursor 175g which consists of the example 4 platinum 4825g and 94 % of the weight of platinum, and 6 % of the weight of cerium. This platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal for 200 hours.

[0032]The 416.7 g alloy precursor which consists of example 5 4396.6 g platinum, 97 % of the weight of platinum, and 3 % of the weight of zirconiums, From the alloy precursor 170g which consists of 99 % of the weight of platinum, and 1 % of the weight of yttrium, and the alloy precursor 16.7g which consists of 94 % of the weight of platinum, and 6 % of the weight of cerium, under use of a zirconium dioxide crucible in a vacuum induction furnace, The platinum alloy which has 0.25 % of the weight of zirconiums, 0.034 % of the weight of yttrium, and 0.02 % of the weight of cerium is fused. A platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal for 200 hours.

[0033]The alloy precursor 230g which consists of the example 6 platinum 4645g, 94 % of the weight of platinum, and 6 % of the weight of cerium, And from the alloy precursor 125g which consists of 99 % of the weight of platinum, and 1 % of the weight of yttrium, the platinum alloy which has 0.275 % of the weight of cerium and 0.025 % of the weight of yttrium is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible. A platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal for 200 hours.

[0034]The 4688.3 g alloy which consists of 90 % of the weight of example 7 platinum, and 10 % of the weight of rhodium, 87 % of the weight of platinum, the alloy precursor 156.7g which consists of 10 % of the weight of rhodium, and 3 % of the weight of zirconiums, And under use of a zirconium dioxide crucible from the alloy precursor 155g which consists of 89 % of the weight of platinum, 10 % of the weight of rhodium, and 1 % of the weight of yttrium within a vacuum induction melting furnace, The platinum rhodium alloy which has 0.094 % of the weight of zirconiums and 0.031 % of the weight of yttrium is fused. A platinum rhodium alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal in the 300-hour air.

[0035]The 4743.3 g alloy, 92 % of the weight of platinum which consist of 95 % of the weight of example 8 platinum, and 5 % of the weight of gold, The alloy precursor 56.7g which consists of 5 % of the weight of gold, and 3 % of the weight of zirconiums, And the platinum-gold-alloy which has 0.034 % of the weight of zirconiums and 0.04 % of the weight of yttrium is fused within a vacuum induction melting furnace under use of a

zirconium dioxide crucible from the alloy precursor 200g which consists of 94 % of the weight of platinum, 5 % of the weight of gold, and 1 % of the weight of yttrium. A platinum-gold-alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2.4-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal in the 400-hour air.

[0036]The 4682.5 g alloy, 92 % of the weight of platinum which consist of 95 % of the weight of example 9 platinum, and 5 % of the weight of gold, The alloy precursor 259g which consists of 5 % of the weight of gold, and 3 % of the weight of zirconiums, And the platinum-gold-alloy which has 0.15 % of the weight of zirconiums and 0.0135 % of the weight of yttrium is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible from the alloy precursor 67.5g which consists of 94 % of the weight of platinum, 5 % of the weight of gold, and 1 % of the weight of yttrium. A platinum-gold-alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal in the 300-hour air.

[0037]The 4833.3 g alloy which consists of 95 % of the weight of example 10 platinum, and 5 % of the weight of gold, And the platinum-gold-alloy which has 0.2 % of the weight of cerium is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible from the alloy precursor 166.7g which consists of 89 % of the weight of platinum, 5 % of the weight of gold, and 6 % of the weight of cerium. A platinum-gold-alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal in the 300-hour air.

[0038]Example 11 (comparison)
The alloy precursor 200g which consists of the platinum 4762g, 97 % of the weight of platinum, and 3 % of the weight of zirconiums, And from the alloy precursor 37.5g which consists of 99 % of the weight of platinum, and 1 % of the weight of boron, the platinum alloy which has 0.12 % of the weight of zirconiums and 0.0075 % of the weight of boron is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible. A platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal in the 300-hour air.

[0039]Example 12 (comparison)
The platinum alloy which has 0.063 % of the weight of yttrium is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible from the alloy precursor 315g which consists of the platinum 4685g and 99 % of the weight of platinum, and 1 % of the weight of yttrium. A platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal in the 300-hour air. The heat-treated platinum-yttrium alloy has the microstructure. However, increase of remarkable crystallite already becomes clear after red heat of 4 hours at 1200 **.

[0040]Example 13 (comparison)
The platinum alloy which has 0.03 % of the weight of yttrium and 0.01 % of the weight of boron is fused within an arc from the platinum 200g, the yttrium 0.06g, and 0.02g of boron. A platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal in the 300-hour air. The heat-treated platinum-yttrium boron-alloy has the microstructure. However, increase of remarkable crystallite already becomes clear after red heat of 4 hours at 1200 **.

[0041]Example 14 (comparison)
The platinum alloy which has 0.074 % of the weight of zirconiums is fused within a vacuum induction melting furnace under use of a zirconium dioxide crucible from the alloy precursor 123g which consists of the platinum 4877g and 97 % of the weight of platinum, and 3 % of the weight of zirconiums. A platinum alloy is cast to an ingot under argon (300 mb), and the sheet metal of 2-mm thickness is manufactured by cold-rolling from this ingot. Next, 1000 ** heat treatment is performed to sheet metal in the 300-hour air. The organization of the heat-treated platinum-zirconium alloy is a coarse particle.

[0042]The specimen of the platinum material indicated in the example 1-14 of measurement of example 15 oxygen content, And the specimen of platinum and the specimen of platinum / rhodium 10 for which it has 99.95% of - purity as - comparison are subdivided into the granulation which has each weight of 25-50 mg, a carbon tetrachloride is first used and washed next using acetone in an ultrasonic bath, and it is made to dry in the about 60 ** hot air succeedingly. Next, at about 2400 **, 300-500 mg of each specimen is put by heating at about 2500 ** beforehand in the graphite crucible in a furnace by which degassing was carried out. The oxygen which existed in the specimen fused at 2400 ** reacts to a graphite crucible, forming carbon monoxide which is removed from a furnace as support gas using helium, and is derived via an oxidation catalyst. A fixed quantity of concentration of the formed carbon dioxide is measured by infrared spectroscopic analysis, and the content of oxygen of this analysis blank test inside of the body is measured. In the 1st table, the oxygen content measured in this way is indicated as oxygen $_{measurement}$ [weight %], and the quantity of required oxygen is indicated to it as the 75% value and 100% value of oxygen $_{theoretical}$ [weight %] theoretically for oxidizing 75 % of the weight of base metals, and 100 % of the weight further.

[0043]As shown in a table, the oxygen content of some specimens exceeds a value 100%. One of the reason of this may be that the oxide formation element, for example, aluminum, and silicon of a quantity very slight as a contaminant contain in a platinum-base metal-alloy. Another guess is that the platinum (it consumes ?)-base metal-mixed oxide which forms oxygen further additionally with an easy base metal oxide, for example, ZrO_2 and PtO, is formed as a result of heat treatment.

[0044]The examination which measures the measurement temporal stability of example 16 temporal stability is done in the device indicated in the 245576th A3 item specification of the East Germany patent. the specimen (the square of 0.8x3-mm^2.) which

consists of an embodiment of the platinum material by this invention indicated in the example using this device 120 mm in length, two commercial materials ((wcHeraeus) and) [wc] Pt-ZGS of Pt-DPH of German ** ** and Johnson Mattei (Johnson, Matthey Ltd.), and ****** **, platinum, platinum / rhodium 10, and the platinum/gold 5 are warmed in the air to a defined temperature within the limits of 1000-1700 **. The tensile stress defined as the specimen is applied until a specimen results in breakage, while warming at 1000-1700 **. next -- passing -- the time -- a graph -- creating -- the graph to interpolation -- 1600 ** or 1500 ** -- (-- the tensile stress which brings about breakage of a specimen, respectively is measured in 10 hours at the temperature of Pt). Thus, the measured tensile-stress value is indicated all over Table II as temporal stability R_m [MPa].

[0045]
[Table 1]

表 I

例	白金材料の組成［重量%］								酸素理論[重量%]	
	Pt	Rh	Au	B	Y	Zr	Ce	酸素測定	75%値	100%値
1	Pt				0.015	0.15		0.0860	0.0425	0.0567
2	Pt				0.014	0.12		0.0623	0.0344	0.0459
3	Pt				0.03	0.1		0.0430	0.0325	0.0433
4	Pt						0.21	0.0430	0.0358	0.0478
5	Pt				0.034	0.25	0.02	0.1040	0.0761	0.1015
6	Pt				0.025		0.275	0.0740	0.0520	0.0694
7	Pt	10			0.031	0.094		0.0490	0.0310	0.0414
8	Pt		5		0.04	0.034		0.0220	0.0170	0.0227
9	Pt		5		0.0135	0.15		0.0450	0.0422	0.0562
10	Pt		5				0.2	0.0400	0.0341	0.0455
11	Pt			0.0075		0.12		0.0062	0.0442	0.0589
12	Pt				0.063			0.0029	0.0128	0.0171
13	Pt			0.01	0.003			0.0011	0.0227	0.0303
14	Pt					0.074		0.0013	0.0195	0.0260
Pt	Pt							0.0001		
PtRh	Pt	10						0.0002		

[0046]
[Table 2]

表　１１

例	経時安定性 1600℃／10hでのR_m[MPa]
1	7
2	5.7
3	5
4	2.2
7	9
8	5
Pt	1*
Pt-DPH	5
Pt-ZGS	5
PtRh10	3
PtAu5	2.5

* 1500 °C/10 h

[0047]

[Effect of the Invention]The platinum material by this invention shows stability and the particle nature of an organization also at an elevated temperature.

[0048]; In the case of the method by this invention which manufactures a platinum material, simplicity and especially economical efficiency are prominent, and it is because oxidation of base metals comparatively quick [selection of the base metal by this invention] during heat treatment of the platinum-base metal-alloy which exists in a close form, and enough for a thing also with surprising also curve is brought about.

[0049]Furthermore, an advantage is the very good deformation behavior and weldability of the platinum-base metal-alloy which melting was carried out and was cast, and the platinum material by which distributed solidification was carried out. That is, the method by this invention may include cold work, hot working, and welding before and after a heat treatment process, and a platinum material may be obtained in the form of half-finished products or a finished product.

[0050]The platinum material by this invention is suitable for all the use fields for which stability is needed at an elevated temperature. It was effective in the use for the device which should be especially used in glass industry and a laboratory, the use for manufacture of covering, and the use as a charge of welding add-in material.